

REMARKS/ARGUMENTS

Favorable reconsideration of this application as presently amended and in light of the following discussion is respectfully requested.

Claim 1 has been amended as supported by the claims and specification as originally filed. New Claim 14 has been added as supported by the claims and specification as originally filed. See for example, page 7 and the Examples. Therefore, the amendment and the new claim are not believed to raise a question of new matter. Claims 1-7 and 9-14 are active.

Applicants wish to thank Examiner Trinh and supervisory Examiner Nguyen for the helpful and courteous discussion with Applicants' Representative on November 7, 2007. During this discussion it was noted that the structures of the claimed carboxylic acids are very different from the structures of the compounds of Gaudiana et al. Further, including Kangs' acids in Gaudiana would change the principle of operation of Gaudiana because Guadiana wants conjugation of a free electron pair on a nitrogen with hybridized orbitals of aromatic rings. Thus, there is no motivation to replace the co-sensitizer of Guadiana with the acids of Kang. Moreover, there is nothing in the references that suggests that the acids of Kang are equivalent to the co-sensitizer of Guadiana.

In addition, it was discussed to add a claim which does not include benzoic acid. Such claim has been added. See new Claim 14.

The present invention as set forth in **amended Claim 1** relates to a dye-sensitized solar cell comprising:

a semiconductor electrode containing a dye and a carboxylic compound, the carboxylic compound being at least one acid selected from the group consisting of acetic acid

(CH₃CO₂H), propionic acid (CH₃CH₂CO₂H), 3-bromopropionic acid (BrCH₂CH₂COOH), benzoic acid (C₆H₅CO₂H) and butyric acid (CH₃CH₂CH₂CO₂H), the dye and the carboxylic compound being carried on a surface of the semiconductor electrode;

a counter electrode; and

an electrolyte composition provided between the semiconductor electrode and the counter electrode, and containing an electrolyte that contains iodine and molten salt of iodide.

The chemical formulas of acetic acid, propionic acid, 3-bromopropionic acid, benzoic acid and butyric acid are CH₃CO₂H, CH₃CH₂CO₂H, BrCH₂CH₂COOH, C₆H₅CO₂H and CH₃CH₂CH₂CO₂H, respectively. Thus, the carboxylic compound recited in Claim 1 does not include a nitrogen atom (N), which is conjugated with an aromatic compound. Once a dye carried on a surface of a semiconductor electrode is excited by absorbing light, electrons are transferred from the dye to the semiconductor electrode, thereby generating power. The carboxylic compound, which is at least one acid selected from the group consisting of acetic acid, propionic acid, 3-bromopropionic acid, benzoic acid and butyric acid, suppresses backflow of the electrons from the semiconductor electrode to an electrolyte composition, thereby improving energy conversion efficiency.¹

The outstanding Office Action indicates that Gaudiana et al. describes a carboxylic compound (Office Action, paragraph bridging pages 2 and 3). However, Figures 6 and 13, as well as paragraphs [0047-0050] of Gaudiana et al mention nothing about “carboxylic compound being at least one acid selected from the group consisting of acetic acid (CH₃CO₂H), propionic acid (CH₃CH₂CO₂H), 3-bromopropionic acid (BrCH₂CH₂COOH), benzoic acid (C₆H₅CO₂H) and butyric acid (CH₃CH₂CH₂CO₂H)” as claimed. Paragraph [0051] of Gaudiana et al mentions dyes that have carboxyl groups as functional groups.

¹ See, for example, the specification at page 34, line 14 through page 35, line 6.

However, there is no disclosure of “carboxylic compound being at least one acid selected from the group consisting of acetic acid ($\text{CH}_3\text{CO}_2\text{H}$), propionic acid ($\text{CH}_3\text{CH}_2\text{CO}_2\text{H}$), 3-bromopropionic acid ($\text{BrCH}_2\text{CH}_2\text{COOH}$), benzoic acid ($\text{C}_6\text{H}_5\text{CO}_2\text{H}$) and butyric acid ($\text{CH}_3\text{CH}_2\text{CH}_2\text{CO}_2\text{H}$)” as claimed.

Thus, Gaudiana et al. fails to teach or suggest “... the carboxylic compound is at least one acid selected from the group consisting of acetic acid, propionic acid, 3-bromopropionic acid, benzoic acid and butyric acid, ...,” as recited in Claim 1.

Further, including Kangs’ acids in Gaudiana would change the principle of operation of Gaudiana because Guadiana wants conjugation of a free electron pair on a nitrogen with hybridized orbitals of aromatic rings. Thus, there is no motivation to replace the co-sensitizer of Guadiana with the acids of Kang. Moreover, there is nothing in the references that suggests that the acids of Kang are equivalent to the co-sensitizer of Guadiana.

Likewise, Wariishi et al. fails to teach or suggest at least “... the carboxylic compound is at least one acid selected from the group consisting of acetic acid, propionic acid, 3-bromopropionic acid, benzoic acid and butyric acid, ... ,” as recited in Claim 1.

Accordingly, independent Claim 1 patentably distinguishes over Gaudiana et al. and Wariishi et al. Therefore, Claim 1 and the pending Claims 2-7 and 9-14 dependent from Claim 1 are believed to be allowable.

In addition, **new Claim 14** has been added **in which benzoic acid is not claimed.** The remaining carboxylic compounds are aliphatic carboxylic acids. The aromatic carboxylic acid used as a co-sensitizer in the disclosure of Gaudiana et al. produces a bonding force to a semiconductor electrode, which is less than that of the aliphatic carboxylic acid. It thus causes disadvantages such as detachment from the surface of the semiconductor electrode. It is expected that the solar cell of Gaudiana et al. brings about a poor durability as compared with the solar cell of the present invention.

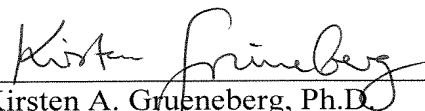
Therefore, the rejections of the claims under 35 U.S.C. § 103(a) over Gaudiana et al in view of Kang et al and Wariishi et al is believed to be unsustainable as the present invention is neither anticipated nor obvious and withdrawal of these rejections is respectfully requested.

This application presents allowable subject matter, and the Examiner is kindly requested to pass it to issue. Should the Examiner have any questions regarding the claims or otherwise wish to discuss this case, he is kindly invited to contact Applicants' below-signed representative, who would be happy to provide any assistance deemed necessary in speeding this application to allowance.

Respectfully submitted,

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